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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ASM AMERICA, INC.

Appeal 2009-015205
Application 10/665,693
Technology Center 3600

Before JAMESON LEE, SALLY C. MEDLEY, and
MICHAEL P. TIERNEY, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

This is a decision on appeal by an Appellant, whose real party in interest is ASM AMERICA, INC. ("ASM"), under 35 U.S.C. § 134(a) from a final rejection of claims 1-23. We have jurisdiction under 35 U.S.C. § 6(b). We *affirm*.

References Relied on by the Examiner

Ozawa et al. ("Ozawa")	5,810,538	Sep. 22, 1998
Edwards et al. ("Edwards")	5,944,857	Aug. 31, 1999
Fishkin et al. ("Fishkin")	6,082,948	Jul. 4, 2000
Tanaka et al. ("Tanaka")	6,395,094	May 28, 2002
Hofmeister	6,481,956	Nov. 19, 2002

The Rejections on Appeal

The Examiner rejected claims 1-6 and 10-23 under 35 U.S.C. § 103(a) as unpatentable over Hofmeister, Tanaka, and Ozawa.

The Examiner rejected claims 7 and 8 under 35 U.S.C. § 103(a) as unpatentable over Hofmeister, Tanaka, Ozawa, and Fishkin.

The Examiner rejected claim 9 under 35 U.S.C. § 103(a) as unpatentable over Hofmeister, Tanaka, Ozawa, and Edwards.

The Invention

The invention relates to a device for handling semiconductor wafers. (Spec. 1:¶ 0002.) Claim 1 is reproduced below (App. Br. 19 claims App'x.):

1. A semiconductor processing tool comprising:

a first substrate handling chamber;

a front docking port located on an outside surface of the first substrate handling chamber;

a robot arm located in the first substrate handling chamber;

a loadlock chamber joined to the first substrate handling chamber; and

a buffer station directly adjacent the first substrate handling chamber and separate from the loadlock chamber, the buffer station

being purged with an inert internal environment separate from the first substrate handling chamber, the buffer station having a rack defining multiple shelves for holding substrates;

wherein the robot arm is configured to access the buffer station.

B. ISSUES

1. Does the record show that a person of ordinary skill in the art would have had adequate reason to combine the teachings of the prior art to arrive at the invention set forth in ASM's claims?

2. Does the record show that a person of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Hofmeister and Tanaka?

C. PRINCIPLES OF LAW

One cannot show non-obviousness by attacking references individually where the rejection is based on a combination of references. *In re Keller*, 642 F.2d 413, 426 (CCPA 1981). The test for obviousness is what the combined teachings of the references would have suggested to those of ordinary skill in the art. *Id.*

A prima facie case of obviousness is established when the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. *In re Rinehart*, 531 F.2d 1048, 1051 (CCPA)

D. FINDINGS AND ANALYSIS

The Examiner rejected claims 1-6 and 10-23 over Hofmeister, Tanaka, and Ozawa and claims 7-9 over those references along with one of Fishkin and Edwards. Claims 1, 10, and 14 are independent claims. Claims

2-9, 11-13, and 15-23 are dependent on one of claims 1, 10, and 14. The dependent claims are argued collectively with the independent claims.

Each of claims 1, 10, and 14 is directed to a semiconductor processing tool which includes a first semiconductor substrate handling chamber and a "buffer station" that is adjacent the handling chamber and operates to hold multiple substrates. Each claim includes a similar limitation in connection with the buffer station which is at issue in this appeal.

In claims 1 and 10, the pertinent limitation reads (App. Br. 19, 20 Claims App'x.):

> the buffer station being purged with an inert internal environment separate from the first substrate handling chamber.

In claim 14, the "buffer station" is a "purgeable buffer station" and the pertinent limitation reads (*id.* at 21):

> the purgeable buffer station configured for sealing and separately purging from the substrate handling chamber.

In the context of ASM's specification, a buffer station is "purged" with an inert internal environment through operation of a gas inlet 36 which supplies a gas to the station and a purge valve 34 for evacuating the station. (Spec. 12:1-4.)

The Examiner determined that Hofmeister discloses a semiconductor processing tool including a substrate handling chamber 13 and a plurality of buffer cassettes or stations B1-B4 defining racks with multiple shelves for holding multiple substrates. (Ans. 5:24-6:10.) The Examiner concluded, however, that Hofmeister does not disclose that its buffer stations are sealed and purged as set forth in the claims. (*Id.* at 6:10-13.) To make up for the deficiency, the Examiner relied on Tanaka.

Tanaka discloses a processing system for semiconductor wafers. (Tanaka 5:45-60.) The system includes two "buffer" parts or stations 44 and 46 which receive wafers W from an adjacent transfer chamber 28. (*Id.* at 6:22-36.) The buffer parts operate to "airtightly separate" space for containing a wafer W apart from the transfer chamber. (*Id.*) Each buffer part includes a preheating unit 48 and a cooling unit 50. (*Id.* at 6:26-27.) As a part of the cooling unit, a gas inlet system 94 operates to introduce a cooled inert gas, such as an N_2 gas, into the buffer part and an outlet exhaust system 96 operates to evacuate the cooling unit. (*Id.* at 7:36-44.) The Examiner determined that Tanaka's buffer parts constitute sealed purgeable chambers which are purged through the operation of the components 94 and 96 of its cooling system which supply and exhaust an inert gas. (Ans. 6:14-22.) The Examiner reasoned that based on the teachings of Tanaka, a person of ordinary skill in the art would have realized that a buffer station holding multiple wafers, such as those of Hofmeister, may be selectively sealed and purged through the supply and evacuation of an inert gas into the buffer station. (*Id.* at 6:22-7:5.)

ASM does not dispute the Examiner's determination that the operation of Tanaka's cooling unit constitutes a purging function. Indeed, ASM also notes that the cooling unit's function "resembles purging." (Reply Br. 3-4.) Rather, ASM challenges the Examiner's rejection first on the premise that a skilled artisan would have had "no reason" to combine the teachings of Tanaka and Hofmeister. (App. Br. 14:6-8.) The basis for that position is that Hofmeister alone "does not indicate the need" to cool its semiconductor substrates. (*Id.* at 14:2-4.)

ASM's position is misplaced. That Hofmeister itself may not recognize a need to cool its substrates does not end the obviousness inquiry. One cannot show non-obviousness by attacking references individually where the rejection is based on a combination of references. *In re Keller*, 642 F.2d at 426. The test for obviousness is what the combined teachings of the references would have suggested to those of ordinary skill in the art. *Id.* In this case, the obviousness analysis is based on the combined teachings of Hofmeister, Tanaka, and Ozawa. We focus in particular on the teachings of Hofmeister and Tanaka taken together.

Hofmeister discloses that its system includes processing modules 14 for processing substrates. (Hofmeister 2:57-61.) Hofmeister further discloses that once processed, a substrate is moved through a load lock, *e.g.*, load lock A, to a buffer station, *e.g.*, buffer B1, for storage. (*Id.* at 6:18-25.) Tanaka discloses that semiconductor wafers, *i.e.*, substrates, may be processed in processing chambers 26 A-D. (Tanaka 5:45-48.) After processing, the substrates are held in a buffer station, *e.g,* buffer part 44. (*Id.* at 6:32-36.) Because processing the substrates may involve heating them to elevated temperatures, Tanaka provides that the sealed cooling units of the buffer parts operate to hold and cool a processed substrate to a manageable handling temperature by supplying and exhausting cooled inert gases in the environment surrounding the substrates. (*Id.* at 7:36-44; 9:7-24.) As noted above, that cooling operation also accomplishes the purging function called for in ASM's claims. The benefit of cooling heated processed semiconductor substrates to an appropriate handling temperature provides adequate reason for a person of ordinary skill in the art to implement Tanaka's teachings in the buffer station of another type of semiconductor

processing device, such as that of Hofmeister. We reject ASM's argument to the contrary.

ASM also argues that a person of ordinary skill in the art would not have had a reasonable expectation of success in combining the teachings of Hofmeister and Tanaka. According to ASM, the basis for that argument is two fold. First, ASM asserts that Hofmeister's buffer cassettes are "conventional cassette racks" that are made of a material which would not reasonably be expected to adequately handle semiconductor wafers that have been heated to the temperatures contemplated in Tanaka, *e.g.*, 600° C. As alleged evidence for that assertion, ASM relies on U.S. Patent No. 6,073,366 to Aswad ("Aswad"). (App. Br. 16:7-26.) Second, ASM asserts that Tanaka's teachings are limited strictly to cooling a single wafer in its buffer station and allegedly would not be expected to cool multiple wafers positioned in a buffer station, such as in Hofmeister. (App. Br. 16:26-17:2; Reply Br. pp. 3-4.)

Neither of ASM's assertions is persuasive. At the outset, ASM's assessment of what the supplied evidence, *i.e.*, Aswad, describes as far as the ability of "conventional cassette racks" to handle wafers at elevated temperatures is incorrect. In relevant part, Aswad simply states that "[w]hile cassettes are available that can handle wafers as hot as 170°C., they are relatively expensive." (Aswad 1:32-34.) Contrary to ASM's assertion, Aswad's recognition that cassettes exist which may handle wafers of one particular temperature, *i.e.*, 170° C. is not a disclosure that cassette racks suitable for withstanding other higher temperatures were unavailable or unknown.

In any event, the rejection at hand is based on the combined teachings of Hofmeister and Tanaka. Even assuming that Hofmeister's racks are made of material unable to withstand elevated temperatures, Tanaka demonstrates that it was known in the art that support for a wafer in a buffer station may be constructed from a material that is adequate to withstand such temperatures. A person of ordinary skill in the art, who is also one of ordinary creativity, *KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 421 (2007), would have readily recognized from Tanaka's teaching that, when seeking to support substrates that have been heated, the support would be constructed from a suitable heat resistant material.

Furthermore, while Tanaka's buffer stations, and in particular the stations' cooling units, may support only a single wafer, Hofmeister teaches that it was known in the semiconductor processing art that buffer stations may also support multiple wafers. ASM speculates that applying Tanaka's teachings of cooling a wafer to Hofmeister's rack would be undesirable and states the following (Reply Br. 4:3-9):

> Converting Hofmeister's buffer cassettes B1-B4 into cooling units for multiple wafers would have been understood to result in temperature non-uniformities across the wafers because the cooling gas would not easily flow between the wafers and would therefore cool the outer edges of the wafers more than their interior portions. This is particularly true where the cooling gas is drawn out by a vacuum source (as taught by Tanaka col. 7, lines 36-41) before it would have much of a chance to migrate between the stacked wafers. That is why post-process wafer cooling is typically conducted only on one wafer at a time.

That speculation is mere argument of counsel and not supported by objective evidence such as declaration testimony of a technical expert. Argument of counsel cannot take the place of evidence lacking in the record.

Estee Lauder Inc. v. L'Oreal, S.A., 129 F.3d 588, 595 (Fed. Cir. 1997). Also, even if cooling a single wafer was "typical," that does not mean cooling multiple stacked wafers, even if less effective, was unknown or would not have been obvious to one with ordinary skill in the art.

A prima facie case of obviousness is established when the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. *In re Rinehart*, 531 F.2d 1048, 1051 (CCPA 1976). On this record, the Examiner established a prima facie basis for rejecting ASM's claims 1, 10 and 14 as obvious in view of the combined teachings of Hofmeister, Tanaka, and Ozawa. In light of the entirety of the evidence, including ASM's submissions, we are not persuaded of error in the conclusion of obviousness.

For the foregoing reasons, we sustain the rejection of claims 1, 10, and 14. The patentability of claims 2-9, 11-13, and 15-23 is not argued apart from claims 1, 10, and 14. We also sustain the rejection of claims 2-9, 11-13, and 15-23.

E. CONCLUSION

1. The record shows that a person of ordinary skill in the art would have had adequate reason to combine the teachings of the prior art to arrive at the invention set forth in ASM's claims.

2. The record shows that a person of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Hofmeister and Tanaka.

F. ORDER

The rejection of claims 1-6 and 10-23 under 35 U.S.C. § 103(a) as unpatentable over Hofmeister, Tanaka, and Ozawa is affirmed.

The rejection of claims 7 and 8 under 35 U.S.C. § 103(a) as unpatentable over Hofmeister, Tanaka, Ozawa, and Fishkin is affirmed.

The rejection of claim 9 under 35 U.S.C. § 103(a) as unpatentable over Hofmeister, Tanaka, Ozawa, and Edwards is affirmed.

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)

AFFIRMED